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Review of State Licenses for Disposal of Low-Level Radioactive Waste by Shallow Land Burial

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State licenses for disposal of low-level radioactive wastes at commercial burial sites are reviewed. Information concerning license terms and conditions, and license administration has been obtained from questionnaires sent to those six states with commercial radioactive waste burial sites. The questionnaire information has been supplemented by recent reports of the Task Force on Radioactive Waste Management of the Conference of Radiation Control Program Directors and personal communications with knowledgeable officials in state and Federal agencies.

A number of problems associated with licensing and license administration by the states have been identified by the Task Force, by the Federal Government Accounting Office (GAO), and by various state and Federal officials. These are summarized and recommendations are included.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION PROGRAMS
LAS VEGAS FACILITY
LAS VEGAS, NEVADA 89114

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June 1976

U.S. ENVIRONMENTAL PROTECTION AGENCY
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PREFACE

The Office of Radiation Programs of the U.S. Environmental Protection Agency carries out a national program designed to evaluate population exposure to ionizing and non-ionizing radiation and to promote development of controls necessary to protect the public health and safety and assure environmental quality.

Within the Office of Radiation Programs, the Las Vegas Facility conducts in-depth field studies of various radiation sources and provides other technical support for a variety of (ORP) program activities. This report was conducted in support of the ORP radioactive waste management program.

Comments on this review would be appreciated. These should be sent to the Director, Office of Radiation Programs-Las Vegas Facility.

Donald W. Hendricks
Director, Office of
Radiation Programs, LVF

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This report was produced primarily from information provided by radiation control program officials in Illinois, Kentucky, Nevada, New York, Oregon, South Carolina, and Washington. Their assistance is appreciated. The accuracy of the information presented is solely the responsibility of the authors, however.

SUMMARY AND CONCLUSIONS

This paper reviews state licenses for burial of radioactive waste by commercial firms. The terms and conditions contained in licenses issued by the States of Illinois, Kentucky, Nevada, New York, South Carolina, and Washington are summarized. For illustration, a license developed for a proposed commercial site in the State of Oregon is included as an appendix.

The procedures and mechanics of license development and administration are reviewed. This information is derived from questionnaires sent to state radiation control officials, supplemented by recent literature and personal communications with knowledgeable officials in state and Federal agencies.

A review of problems encountered with the burial sites and the administration of licenses reveals a number of unresolved difficulties. Some of these concerns have been previously addressed by the Conference of Radiation Control Program Directors Task Force on Radioactive Waste Management (Cashman, 1973, 1974), and by the Federal General Accounting Office (GAO, 1976). Additional problems, not noted elsewhere, in the area of license enforcement, are reviewed herein.

INTRODUCTION

PURPOSE

In 1972, a questionnaire was sent to radiation control programs of the six states in which commercial radioactive waste burial sites are operated. This survey was performed by the Environmental Protection Agency in conjunction with the Conference of Radiation Control Program Directors Task Force on Radioactive Waste Management (Cashman, 1973).

Information was collected on a number of subjects relating to burial site licensing and license administration. It was subsequently used by the Task Force as the basis for recommendations to the Conference. A systematic compilation of the information collected has not been published, however.

This report, which is concerned with burial site licensing, attempts to summarize information obtained from the questionnaire responses and other sources of recent information. It is intended to assist those concerned with the development of licensing criteria, review of license applications, and the administration of existing licenses. As an example, a license (which was not issued) developed by the State of Oregon in 1974 for a radioactive waste and hazardous chemical burial site is included as an appendix to this report.

SUMMARY OF RECENT DEVELOPMENTS

A number of problems, which relate in part, to licensing and regulation of commercial radioactive waste burial sites have been experienced in recent years. A recent report of an investigation by the Federal General Accounting Office summarized problems encountered at Federal and commercial burial sites and identified a number of deficiencies in Federal regulatory programs for commercial burial sites (GAO, 1976).

The Nuclear Fuel Services (NFS) site in West Valley, New York, was closed by NFS in March 1975, upon the discovery that water containing tritium and strontium-90 had seeped from a burial trench (Nucleonics Week, 1975). A request was made by NFS to New York State regulatory authorities for clarification of operational requirements in order to control the problem.

In early 1975, the Kentucky Department for Human Resources

(KDHR) reported that off-site migration of radioactivity from the Nuclear Engineering Company (NECO) Maxey Flats burial facility had been observed (Hardin, 1975). The KDHR subsequently requested guidance from the EPA concerning the development and application of "as low as practicable" criteria for radioactivity released to the environs from the burial site. A detailed review of the data and developments associated with the occurrence of off-site migration at the Maxey Flats site has been recently published (Meyer, 1976).

The Nuclear Engineering Company (NECO), Beatty, Nevada burial site license was suspended by the State of Nevada in March 1976. The license was suspended and operations terminated when it was determined that materials intended for burial had been removed rom the site by employees for a number of years (Trounday, 1976).*

HISTORICAL BACKGROUND

Production of significant quantities of radioactive waste in the United States began during World War II with the Federal program to develop nuclear weapons. Since that time, control of radioactive waste material has been achieved by temporary storage, placement in the ground by a variety of means, and by disposal at sea. With the exception of ocean disposal, these activities were initially conducted at laboratory or test sites owned by, and operated under the jurisdiction of the Federal Government.

The U.S. Atomic Energy Commission (AEC) gradually phased out commercial ocean dumping in the 1960's (Belter, 1970). In 1960, the AEC published criteria for selection, licensing, and operation of commercial waste burial facilities (AEC, 1960). These guidelines included a number of considerations, which are summarized here:

1. The location of burial sites on state- or Federal Government-owned land, under long-term Government control to assure protection of public health and safety.

2. Site selection based on detailed studies of geologic, hydrologic, and topographic factors which would result in a site with maximum inherent retention capability for radioactivity. Containment would be assured primarily by site characteristics with little reliance on waste containers.

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* The suspension was lifted by the State of Nevada in May 1976, following an investigation which determined that a public hazard did not exist. The suspension was lifted subject to the strengthening of inadequate security measures at the site which had involved "breaches of the license" (Nevada, 1976).

3. Emphasis would be placed on operating and monitoring practices, including radiation surveillance of surrounding areas to insure that the operation is conducted in a safe manner.

4. These sites would be used for the disposal of low and intermediate level wastes only.

In 1962, the first license was granted to the Nuclear Engineering Company for the operation of a commercial radioactive waste burial facility at Beatty, Nevada. The number of sites increased to the present six with the opening of the Chem-Nuclear Systems, Inc. site at Barnwell, South Carolina in 1971. Proposals have been made for additional sites in several other states in recent years, but no other sites have been approved or licensed.

IDENTIFICATION OF TECHNICAL AND POLICY ISSUES

Concern has been expressed by a number of state and Federal officials about the proliferation of commercial burial sites in the absence of a national plan. This matter headed the list of issues which had been identified by the Task Force on Radioactive Waste Management in its report to the 1974 Conference of Radiation Control Program Directors (Cashman, 1974). The AEC had also issued recommendations for requirements for new burial site license applications in response to the concerns over burial site proliferation and related issues (AEC, 1974).

The 1974 Task Force report (Cashman, 1974) recommended the following requirements for new site license applicants:

1. The need for a new site should be demonstrated by the applicant and supported by an analysis of the economic impact on existing sites.

2. Applicants for burial site licenses should complete a full environmental report including a detailed cost-benefit analysis.

3. Information should be provided on the proposed funding of perpetual care and maintenance programs for each site, to be administered by the appropriate state agency.

4. Plans for site decommissioning, including cost estimates, should be provided by the applicant prior to the licensing of a new site.

A number of other issues have been identified which effect license terms and conditions concerning the definition of materials which are acceptable for burial in commercial sites. The AEC proposed in 1974 to prohibit land burial of wastes containing transuranium elements in concentrations greater than 10 nanocuries

(nCi) per gram (AEC, 1974). In January 1975, the newly-formed Nuclear Regulatory Commission (NRC) inherited those regulatory programs and functions formerly vested in the AEC. The proposed AEC rulemaking action on transuranic wastes is currently under review by the NRC (Chapman, 1975). The Task Force developed interim guidance for states to apply to existing site licenses in its 1974 report to the Conference (Cashman, 1974).

The Task Force recommended that each package of waste intended for nonretrievable burial in commerial sites contain less than 10 nCi/gm of plutonium. This restriction should be specifically stated as a license condition. It was anticipated by the Task Force that the implementation of such a policy for plutonium would establish a procedure that could be subsequently applied to other transuranics (Cashman, 1974). Several states have subsequently issued license amendments to existing sites prohibiting burial of plutonium. Final guidance concerning the administration of this requirement by the states remains to be given pending publication by the NRC of the final rule-making action.

Additional Task Force recommendations concerning the nature of materials acceptable for burial at commercial sites are summarized from the 1974 report (Cashman, 1974):

1. Non-radioactive toxic chemicals and wastes should be excluded from disposal at sites designated for radioactive waste burial.

2. Pyrophoric materials, gases compressed to greater than 1.5 atmospheres, and bulk-unsolidified radioactive waste liquids should be excluded from burial.

3. Existing commercial sites meeting requirements for disposal of wastes from nuclear power plants, hospitals, and laboratories should not be used to dispose of high-volume, low-specific activity wastes such as uranium mill tailings.

As indicated by the discussion above, a number of issues have been identified concerning the siting, licensing, management, and regulation of the burial sites. The criteria published by the AEC in 1960 have been expanded to include a number of specific issues which have surfaced during the past 14 years of experience with the commercial sites. It is noted that several of the states have recently, or are presently, rewriting their site licenses, motivated in part by the desire to incorporate some of the specific items that were not included in the original licenses. It is also worth noting that the burial site operations and their regulation are under a great deal more public and technical scrutiny than when they were originally licensed. The general trend is to include more conservative criteria in the licenses than existed at the time of the original licensing.

LICENSE ADMINISTRATION

PURPOSE OF LICENSE

Poorly managed and controlled radioactive waste disposal sites pose a potential hazard to public health and safety and have the potential of denying portions of the environment to safe, long-term human occupancy. Burial site licensing and regulation generally fall under the purview of state codes and regulations (within the framework of NRC agreement state programs where applicable) for the control of radioactive materials. In most cases, several state agencies may be involved with the administration of site licenses and leases. In those states in which the burial site is located on state-owned land, the site is leased by the operator from the state with the lease being under the administration of a designated agency. A particular agency is identified as the state executive agency and grants licenses or permits for the possession, use, and disposal of radioactive material in conformity with state statutes and applicable Federal laws. The license is the authority for the company to operate a waste burial site in the state receiving remuneration for accepting and disposing of radioactive waste materials.

AUTHORITY AND SCOPE

Table 1 shows the governmental authority structure for the development of licenses or other regulatory management of waste disposal sites. Table 2 summarizes the scope and authority for the specific burial site licenses. Federal regulations require the licensing of persons who carry out land burial of solid wastes contaminated with radioactive materials.* The license may be issued by the NRC or an "agreement state" (i.e., one which licenses certain activities under agreement with the NRC pursuant to 42 U.S.C. 2021). The agreement authorizes the state to regulate by-product, source, and limited quantities of special nuclear material. The state may require additional operating permits for the control of air and water pollution of a non-radioactive nature. In states without agreements with the NRC to license radioactive material, authority to license burial of radioactive wastes is retained by the NRC; however, certain controls regarding use and operation of a waste disposal site are required by individual state regulations.

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* Radioactive materials herein refers to those materials designated in 10 CFR 20 as "by-product", "special nuclear", and "source" materials, and defined therein.

TABLE 1. REGULATION OF RADIOACTIVE WASTE DISPOSAL SITES

Basic Statutes and Regulations

Energy Research and Development Act 1974
National Environmental Policy Act 1969
Atomic Energy Act 1954 (and amendments)
Public Health, Sanitary, and Safety Codes (States)
Radiation Control Acts (States)*

Federal Agencies

Department of Transportation (DOT)
Nuclear Regulatory Commission (NRC)
Environmental Protection Agency (EPA)

State Agencies

Environmental Protection
Public Health or Human Resources
Atomic Development
Commerce
Department of Conservation and Natural Resources

Regulatory Actions

Issue license to receive, possess, use, and dispose of radioactive material (NRC and states)

Publish rules for safe use and radiation protection (NRC)

Publish rules for transportation of radioactive wastes in interstate commerce (DOT)**

Transfer authority to state to license radioactive material under agreement (NRC)

Establish generally applicable environmental standards (EPA)

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* Generally referred to as "enabling legislation" which provides for promulgation of specific radiation control regulations by the states.

** Intrastate transport of radioactive materials does not fall within the purview of DOT. Several states have issued regulations concerning intrastate transportation which includes the provisions of the DOT regulations.

TABLE 2. SCOPE AND AUTHORITY FOR SPECIFIC BURIAL SITE LICENSES

STATE	SCOPE OF LICENSE	AUTHORITY (OR PRIMARY ENABLING LEGISLATION)
Illinois (Sheffield Nuclear Center)	"purchase, lease, accept or acquire suitable site for the concentration and storage of radioactive wastes" (In this state, the NRC licenses the disposal operation)	Radioactive Waste Act, 1963, Chap. 111.5, Sec. 230 of Illinois revised statutes (Director of Public Health)
Kentucky* (Maxey Flats)	"receive, possess, package, store and dispose of radioactive material at . . . subject to all applicable rules and regulations"	Kentucky Board of Health Regulations KRS 152.105 et seq. to orders of Kentucky Dept. of Health, Rad. Health Prog.
Nevada* (Beatty Facility)	"receive, process, package, store and dispose of by-product, source and special nuclear material"**	State of Nevada Revised Statute 459 "Nuclear Affairs"
New York* (West Valley Site)	"receives solid radioactive wastes packaged as designated, bury waste by licensed procedures, maintain insurance from liability, special services from technical personnel available for damaged or non-compliant packages"	New York State Sanitary Code (Exemption form Sec. 16.8, part 16) Responsible for New York Public Health Laws, Waste Agreement with Atomic and Space Development Agency, also Dept. of Environ. Cons. Chap. IV, part 380

* NRC Agreement State

** Currently amended to include the 10 nCi/gm limitation on plutonium.

TABLE 2. SCOPE AND AUTHORITY FOR SPECIFIC BURIAL SITE LICENSES, CONTINUED

STATE	SCOPE OF LICENSE	AUTHORITY (OR PRIMARY ENABLING LEGISLATION)
South Carolina* (Barnwell Site)	"receive, possess, store, and dispose of radioactive material at locations designated"	Atomic Energy and Rad. Control Act of 1962 Code of Laws of S.C. S.C. State Board of Health Rules and Regulations, Title A, part I
Washington* (Richland Site)	"to receive, possess, repackage, store, and dispose by burial in the soil . . . waste materials"	Nuclear Energy and Rad. Control Act RCW 70.98 and Rules and Regulations, Washington State Department of Social & Health Services

* NRC Agreement State

In summary, the three companies now operating the six waste disposal sites hold licenses or permits to bury radioactive material issued directly from the NRC or by an agreement state for the Federal Government.

APPLICATION POLICY FOR LICENSE

As a part of the procedure for licensing low-level radioactive waste disposal sites by a state, the applicant for a license is required to follow certain policies and provide information to the responsible state agency. Although the requirements may vary by state, the following provisions must generally be satisfied prior to the granting of a license:

1. Disposal of waste should be on state- or U.S.-owned land.

2. Technical information on site and operating procedures should be supplied by an applicant for a license.

3. Financial arrangements, such as trust funds, should be made to cover costs of maintaining the site, including surveillance in perpetuity.

4. The site operator should include a provision for liability insurance coverage.

5. An environmental impact assessment of the proposed burial site and its operation will be required for new sites (Stanford, 1975).

6. A public hearing should be held and a review be conducted by other agencies having responsibility for any aspect of the operation.

FINANCIAL RESPONSIBILITY, REPORTS, AND RECORDS

Financial responsibility provisions of the licenses, in the case of the states in this evaluation, are as follows:*

1. License fees payable to the states range up to $3,000 annually. In one case, fees were paid to both state and Federal licensing agencies. Federal NRC charges are an initial fee of $500 with a proposed annual fee of $300.

2. Performance bonds of up to $500,000 are generally requested to be posted by site operators, if available.

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* Most of the states are currently in the process of reviewing license fees, bonding requirements, and perpetual care fund assessments with increases in nearly all cases to be expected.

3. Liability insurance is specified in license documents in the minimum amount of one (1) million dollars.

4. Licensee burial charges to customers range up to about $2.50 per cubic foot of waste buried, of which a specified amount is allocated to perpetual care funds (currently ranging up to $0.25 per cubic foot of waste buried. In addition to burial charges, other charges may be imposed on customers by the site operators to cover special handling and packaging, for example.

Periodic reports are required of the licensees on such matters as waste receipts and environmental monitoring. Special reports may be required for incidents such as accidents, radiation exposures, contaminating events, uncontrolled releases of radioactive material to the site environs or other specified events as required by license conditions. Financial record keeping and reporting is generally the same as required by Federal and state regulations for any similar business enterprise.

For each shipment of waste received at a burial site, a receipt form is completed. These are generally referred to as radioactive shipment records (RSR's). The site operators, in some cases, are required to send a copy of each RSR to the appropriate licensing agency, while in other cases, are merely required to maintain a copy on site for inspection upon request.

The RSR contains information identifying the origin of the waste, estimates of quantities of source material, by-product material, or special nuclear material and quantities of specific isotopes where appropriate. The site operator is generally required to keep a log of receipts and a record of burials in the trenches. The logs and operational records of the licensees are also made available to licensing agency officials for inspection upon request.

ENFORCEMENT

License administration and enforcement are generally conducted by the states through several means. Requests for amendments and exemptions concerning specific license conditions are routinely received and reviewed. In routine or non-controversial cases, decisions on such requests are usually made by officials of the licensing agency, and formal notification is made to the site operator. In controversial or contested actions, a hearing can be convened to review pertinent information and obtain testimony from interested parties. State officials also review reports submitted by burial site operators on environmental monitoring, radioactive waste inventories, and other topics.

In conformance with NRC agreement state arrangements, periodic on-site inspections are conducted by state officials. In most of

the states, this occurs at least semiannually, and the trend is toward more frequent inspections. For those sites holding NRC licenses, additional inspections are conducted by the NRC.

If deficiencies in the site operation, or violation of license conditions are discovered, several kinds of enforcement action are available to the state agency. In most cases, a letter of non-compliance is written to the licensee to which the licensee is requested to respond within a specified period indicating how the condition(s) of non-compliance will be corrected. The state can subsequently conduct a follow-up inspection, if necessary, to determine compliance.

Should the above described actions yield unsatisfactory results, or in the case of serious or flagrant and continued violations, the state can issue a formal "show cause" order. This gives the licensee a specified period to show cause why the license should not be suspended or revoked. In at least one case, this mechanism has been used by a state to gain compliance with license conditions (McElwain, 1972). In the case of an emergency situation, i.e., where the potential exists for public hazard, a burial site license can be suspended by state authorities on immediate notice, as done recently by the State of Nevada (Trounday, 1976).

In addition to suspension or revocation of licenses, other sanctions are available such as fines and penalties under state civil codes. As far as is known, however, these have not been applied to burial site licensees to date.

Several problems have been encountered in the area of enforcement. Most licenses do not contain provisions for identifying exactly what constitutes non-compliance with license conditions on the part of the licensee. As expected, this is a matter of judgment on the part of licensing agency officials, particularly on items which appear to be less than "flagrant" violations.

To date, the states have largely relied on voluntary corrective action by the licensees in regard to correcting noted deficiencies and items of non-compliance. In several cases where this has not been forthcoming, there has been little success in obtaining compliance short of issuance of a "show cause" order for license revocation. Application of effective intermediate sanctions such as fines by the states has not been achieved, partly due to the difficulty in imposing civil penalties in the face of legal resistance on the part of licensees.

The recent GAO report (GAO, 1976) contains a discussion of regulatory problems encountered at several of the commercial burial sites, with recommendations to the NRC for improving regulatory efforts.

It should be noted that effective administration of commercial radioactive waste burial site licenses has required the expenditure of significant financial and manpower resources by the state agencies concerned. In several of those states with relatively modest radiation control programs, the burial sites have required a disproportionate share of the program resources.

A number of problems, such as too infrequent inspections, insufficient environmental monitoring by the states, and lengthy response periods to license amendment and renewal applications, could be relieved if a way could be found to provide adequate resources for operation of several of the state radiation control programs.

SUPPORTING INFORMATION

Any applicant for a burial site license is required to submit supporting information. This information includes reports of site characteristics, operation and safety manuals, and other material in response to specific requests by the licensing agency. Such information assists the agency in determining the suitability of the proposed site and the fitness of the applicant to carry out the operation of the activity in a safe and responsible manner. It is also generally used as the basis for setting technical conditions and operational requirements, and in such case, would be incorporated in the license by reference.

Supporting documentation describing the site and its environs should include:

1. General descriptive material including location, land use, and population distributions for the site environs.

2. Topographical, geographical, meteorological, geological, and hydrological characteristics with analysis and evaluation related to the disposal site operation.

3. Proposed radiological and hydrological monitoring procedures, including well log data, water quality surveys, and the air sampling program.

Operations and safety manuals should include descriptions of:

1. Qualification and training of personnel in key areas of radiation monitoring and health physics practices relevant to burial site operation.

2. Radiation protection procedures and instrumentation.

3. Burial site operating facilities and equipment.

4. Receipt, handling, and burial of wastes, including trench management.

5. Emergency procedures.

The NRC will require applicants for new burial site licenses to file an environmental report. The required environmental report should contain a cost-benefit analysis for the proposed operation. An analysis which predicts the transport of radionuclides from buried waste materials through the geologic media to off-site environs shall be developed by the applicant and included in the environmental report (Stanford, 1975).*

LICENSE FORM

The licenses themselves, as issued originally without amendments, generally are fairly short documents. Most include a great deal of material by reference, as indicated. Referenced often are the regulations of the Department of Transportation (DOT) (49CFR173-179) relating to packaging of radioactive materials, marking and labeling of the package, placarding of transportation vehicles, and transportation accident reporting.

Also referenced are state rules, regulations, or standards for atomic energy, health, environmental protection, and radiation control.

Table 3 summarizes the form of the current licenses. In most cases, the licenses have been changed and expanded through the addition of amendments subsequent to the issuance of the original license.**

LICENSE CONDITIONS AND PERFORMANCE REQUIREMENTS

Although there are variations between the six disposal sites, the following requirements or license conditions were present either in the license itself or in statements of responsible state officials describing operations at the burial sites, in response to the Task Force questionnaire.

1. Radioactivity limits are usually the amount expressed as a possession limit for the operator or as permitted for storage above ground prior to burial. Typical values are: a) 50,000 curies of by-product materials, b) 4,000 to 60,000 pounds of source materials, and c) 350 grams

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* At the time the licenses were issued for the existing sites, criteria and guidance for environmental assessments as currently applied to environmental reports were not available.

** The six commercial site licenses have been amended numerous times by letter so that the actual size of the file, including amendments, may be 10 to 20 times that of the original license. Also included, by reference in the licenses, is a considerable amount of additional material on regulatory, administrative, and technical aspects.

TABLE 3. CURRENT FORM FOR STATE LOW-LEVEL RADIOACTIVE WASTE BURIAL SITE LICENSES

STATE	ISSUE YEAR*	LENGTH OF LICENSE**	TERMS AND CONDITIONS	REMARKS
Nevada	1965	8	Basic authority to possess and bury waste under 21 conditions	Numerous amendments, exemptions, and procedural changes since 1965 AEC License 4-37661. Ref. to Fed. Reg. AEC 10CFR20,30,40, and 70, DOT Regs. and Nevada Codes
Illinois	1966	11	Radioactive Waste Act (3 pages) authority to acquire site and Dept. of Health Criteria (8 pages) 30 conditions	State statute for site acquisition with published criteria for selection of site and supervision of operation of waste disposal site, state leased site 1966
South Carolina	1971	4	Authorizes receipt and burial under 26 conditions	Ref. to State and Federal rules and regs. for radiation protection and transportation
Kentucky	1967	5	Authorizes burial of waste under 24 conditions	Ref. to State and Federal transportation, safety, and radioactive protection stand.
Washington	1965	2	Basic radioactive materials use license stating materials, form, and amounts for burial under 16 conditions	Ref. to separate State letter procedures for trenching. Also State and Federal rad. and transportation regs.
New York	1963	5	Authorizes operation of radioactive waste disposal site under 26 general terms and conditions	General ref. to State and Federal regs., initial license as exemption to State Sanitary Code (1963)

* Year of issue of license in effect at time of 1972 questionnaire, several have since been renewed or have renewals pending.

** Single spaced, pages typed.

of uranium-235, 200 grams of uranium-233, 200 grams of plutonium*, or the weighted sum limit.** If possession is requested for more than the above specified amounts of special nuclear material, a nuclear safety analysis must be performed, which demonstrates that accidental criticality cannot occur. Storage time above ground is generally limited prior to burial. (Additional amounts of tritium, krypton-85, and special nuclear material may be allowed by a specific license amendment.)

2. A daily log of waste received is normally maintained by the site operator showing quantity, type, and origin with container dose rates and transport class specified.

3. In some cases, periodic summary reports are required for submission to the state agency, including volume, activities, grams of special nuclear material, pounds of source material, curies of by-product material, and form of waste handled during the reporting period.

4. Burial trench specifications are usually indicated with provisions for control of water in exposed trenches. A separate, permanent concrete or metal marker indicating basic information on buried material is required in most cases, to be placed at each end of filled trenches.

5. Pyrophoric or explosive material is prohibited in at least one site.

6. Site safety and fire protection is specified by reference to appropriate state regulations.

7. Radiation protection standards are included by reference to state and Federal regulations. Normally, NRC Regulations 10CFR20, 40, and 70, or equivalent state radiation control regulations are referenced.

8. The activities of the operator in the transportation of radioactive materials are required to be in conformance with U.S. Department of Transportation regulations (10 CFR71.5b references DOT regulations for shipment of radioactive materials) for interstate shipment.

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* The imposition of the limitation of wastes bearing transuranium elements to less than 10 nCi of such nuclides per gram of waste would effectively remove plutonium from criticality safety considerations.

** The weighted sum limit cannot exceed unity and is determined by summing the ratio of each isotope present to the allowable limit in cases where more than one species of special nuclear material is present.

9. Determination of radioactivity levels in surface and ground-water is generally required and, in some cases, soil and vegetation sampling, on a quarterly or monthly basis, is specified.

10. Other license terms of an administrative nature include:

    a. Designation of operators and radiation safety or health physics staff.

    b. Location of disposal operations.

    c. Burial charges.

    d. Leasing of land.

    e. License fees.

    f. Insurance.

11. Actions permitted by special written authority of the state have included:

    a. Solidification of certain liquid wastes.

    b. Dewatering and storage of contaminated ion-exchange resins.

    c. Burial of high specific activity radioactive wastes when packaging is concrete and metal, or as approved by the licensing.

    d. Burial of wastes that are both chemically toxic and radioactive.

REFERENCES

Atomic Energy Commission, *Memorandum to Agreement States*, January 16, 1974

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APPENDIX

LICENSE CONDITIONS

DEVELOPED BY OREGON DEPARTMENT OF

ENVIRONMENTAL QUALITY FOR A PROPOSED

COMMERCIAL HAZARDOUS WASTE DISPOSAL SITE

This section contains the license developed by the Oregon Department of Environmental Quality for a proposed site for disposal of radioactive and chemically hazardous wastes. It was included in the record of the public hearing conducted by the Oregon Environmental Quality Commission on September 6, 1974, in Dalles, Oregon. The draft license is intended to provide an example of the terms and conditions which comprise a license for a commercial radioactive waste burial site.

A. GENERAL CONDITIONS

A1. Authorized representatives of the Department of Environmental Quality (hereinafter referred to as the Department) shall have access to the site, at all reasonable times, for the purpose of inspecting the site and its facilities and the records which are required by this license.

A2. The Department, its officers, agents and employees shall not have any liability on account of the issuance of this license or on account of the construction, operation or maintenance of facilities permitted by this license.

A3. The issuance of this license does not convey any property right or exclusive privilege, except pursuant to the lease for the State-owned portion of the site, nor does it authorize any injury to private property or any invasion of personal rights, nor any violation of Federal, State, or local laws or regulations.

A4. The Department may revise any of the conditions of this license or may amend the license on its own motion in accordance with applicable rules of the Department.

A5. Transportation of wastes to the site by or for the licensee shall comply with rules of the Public Utility Commissioner of Oregon, the State Health Division, and any other local, State, or Federal agency having jurisdiction.

A6. A complete copy of this license and approved plans and procedures shall be maintained at the site at all times.

A7. The licensee shall not conduct, or allow to be conducted, any activities that are not directly associated with the construction, operation, or maintenance of the disposal facilities at the site as authorized by this license, without written approval from the Department for such other activities.

A8. The licensee shall not sell or otherwise dispose of any portion of the site without prior written approval from the Department. This condition shall survive the expiration, revocation, suspension, or termination of the license for any reason other than those specified in condition C7, for a period of two years during which time the Department shall have exclusive right and option to purchase all of the site and improvements thereon not theretofore deeded to the State at book value of the site and improvements on the books of the licensee, net of depreciation and depletion.

B. SPECIAL CONDITIONS

Management of the site, including all activities related to processing, treatment, handling, storage, and disposal of wastes at the site, construction and maintenance of facilities at the site, and monitoring and maintenance of records concerning operation of the site shall conform with the following conditions, limitations, and provisions:

B1. No construction activities related to waste disposal facilities at the site may be undertaken by the licensee until the Department has approved in writing final plans for facilities proposed by the licensee.

B2. Following written approval by the Department of final detailed engineering plans, the licensee shall proceed expeditiously with, and complete, construction of the approved facilities.

B3. No disposal activity may be undertaken by the licensee until the Department has inspected the site and certified in writing that the facilities provided for disposal activities are satisfactory and comply with approved final detailed engineering plans.

B4. Following certification of the site and facilities (condition B3), the licensee shall commence operation of the site and facilities as soon as possible thereafter. Operation shall not be discontinued without the approval of the Department, except for temporary work suspension caused by conditions beyond the control of the licensee such as, but not limited to, labor disputes, weather conditions, equipment failure, shortages of materials, or unavailability of qualified personnel. In the case of a temporary discontinuance of disposal activities which exceeds 5 working days, the licensee will notify the Department in writing, giving the reason for the shutdown, and the estimated time of the temporary closure.

B5. Conditions B1, B2, B3, and B4, and other conditions of this license shall apply to initial facilities and operations, and to any subsequent facilities and operations proposed by the licensee.

B6. Transportation, handling, disposal, treatment, monitoring, and other activities at the site shall comply with procedures and plans approved by the Department and other conditions of this license.

B7. In the event of fires, accidents, or emergencies that occur at the site, or during transportation of wastes to the site, the licensee shall employ emergency procedures approved by

the Department. The occurrence of any fires, accidents, emergencies, or other unusual conditions at the site, or in connection with transportation of wastes to the site, shall be reported to the Department as soon as possible, such that the Department can monitor or direct clean-up or other activities necessary to rectify conditions resulting from the incident. If deemed necessary, the Department may require special precautions to be taken during, or as the result of fires, accidents, or emergencies.

B8. Before use of the site for disposal is terminated, the licensee shall restore the site to its original conditions, to the extent reasonably practicable. No less than one year prior to intended closure of the site, the licensee shall submit detailed plans for the Department's approval indicating steps to be taken to properly close and restore the site.

B9. Upon completion of each burial trench, a granite or concrete marker shall be erected at the end of the trench. To such trench markers shall be attached a bronze or stainless steel plate which shall contain the following information: a trench identification number; dimensions of the trench and its location relative to the marker; volume of waste buried; and dates of beginning and completion of burial operations. For radioactive waste trenches, markers shall also include the total quantity of radioactive material, the quantity of source material only, and the quantity of special nuclear materials only buried in the trench.

B10. The licensee may at any time propose in writing for the Department's consideration, changes in previously approved facilities or procedures, or the addition of new facilities or procedures.

B11. The licensee is authorized to accept and dispose at the site only those chemical wastes for which specific treatment and disposal procedures or research programs have been approved by the Department. Treatment and disposal of chemical wastes at the site shall be conducted only in facilities approved by the Department.

B12. Within 14 days after receipt of a written request for service from a waste generator or source specifying the volumes and chemical and physical composition of wastes requiring disposal, if treatment and disposal procedures have not been previously approved by the Department, the licensee shall forward a copy of such request to the Department together with either:

a. Proposed treatment and disposal procedures; or

b. A proposed research program for development of disposal procedures and the time required for completion; or

c. A determination that the wastes should not be accepted at the site and the reasons therefor.

Any treatment or disposal procedures or research programs which are approved by the Department pursuant to such requests shall be undertaken by the licensee as soon as practicable.

B13. Notwithstanding the provisions of condition B12, item c, if the Department determines that any specific waste originating in Oregon should be disposed at the site, based on unavailability or unfeasibility of alternative disposal methods or other factors, the licensee shall provide disposal for such waste under treatment or disposal procedures directed by the Department utilizing existing site facilities and equipment. In the event the treatment or disposal procedures directed by the Department require additional facilities or equipment, the obligation of licensee shall depend upon financial commitments by the waste generators satisfactory to licensee.

B14. No less than 18 months and no more than 21 months after the effective date of this license, the licensee shall submit a report to the Department which outlines the feasibility of adding incineration facilities at the site. This report shall include an analysis of: the types and volumes of organic wastes that would be amenable to incineration; volumes of such wastes that have been disposed at the site by other means; conceptual design for appropriate incineration facilities including capital and operating costs; method of feed, hourly feed rate, hours of operation, quantity and character of air contaminants to be emitted, and proposed monitoring equipment, if any; and other information pertinent to incineration.

B15. The licensee is authorized to accept and dispose of radioactive wastes at the site, including naturally occurring or accelerator produced isotopes, by-product material, source material and special nuclear material, but excluding radioactive wastes under sole Federal jurisdiction. Acceptance and disposal of radioactive wastes at the site shall be subject to all applicable conditions of this license and in compliance with procedures approved by the Department and only in facilities approved by the Department.

B16. The volume of radioactive wastes originating from sources outside Oregon which are accepted for disposal at the site shall not exceed 150,000 cubic feet per year averaged over

the five-year period beginning on the effective date of this license.

B17. The licensee shall not receive and possess unburied, at any time at the site, radioactive waste in excess of:

a. 5,000 curies of radioactive material in any form.

b. 60,000 pounds of source material in any form.

c. Special nuclear material in quantities of 350 grams of Uranium 235 or 200 grams of Uranium 233 or any combination of special nuclear material such that the sum of the ratios of the quantities possessed to the quantities specified herein shall not exceed unity. Unity shall be determined by the following formula:

$$\frac{\text{grams possessed U-235}}{350} + \frac{\text{grams possessed U-233}}{200} = 1$$

B18. The licensee shall not conduct any of the following activities at the site:

a. Burial of liquid radioactive wastes.

b. Burial of gaseous radioactive wastes which are above 1.5 atmospheres absolute pressure.

c. Incineration or burning of radioactive wastes.

B19. The licensee shall not open any packages of radioactive wastes at the site except to repair or repackage containers damaged in transit or to remove wastes for solidification. For purposes of returning or reusing outer shipping packs and casks, the licensee may remove intact inner containers for disposal.

B20. All radioactive wastes received at the site which are to be buried shall be placed in a burial trench as soon as possible, normally on the day of receipt at the facility, except in the case of radioactive wastes which are to be solidified. In no case shall wastes be stored above ground for longer than 5 days unless the Department is notified and approves of storage for a longer period. Liquid or slurry radioactive wastes which are to be solidified shall not be stored at the site for a period greater than 6 months from the date of receipt prior to burial.

B21. Packages containing special nuclear material shall be separated by a minimum of 8 inches of earth in the burial trenches.

B22. Radioactive wastes containing transuranic elements (atomic number greater than 92) shall not be accepted at the site.

B23. The licensee shall comply with Oregon Regulations for the Control of Radiation, Parts B.100 and C, of the Oregon State Health Division. All reporting and notifications required of the licensee by such regulations shall be to both the Radiation Control Section of the State Health Division and the Department.

B24. Trenches used for disposal of radioactive wastes shall not be used for disposal of wastes not containing radioactive materials.

B25. Level indicating devices shall be provided on liquid or slurry radioactive waste storage tanks. In the event leakage is found or suspected from and such tank, it shall be removed from service and the Department shall be notified immediately.

B26. Decontamination of employees and of equipment to remove radioactive material shall comply with procedures approved by the Department. Wastes resulting therefrom shall be disposed in compliance with procedures approved by the Department.

B27. Radioactive wastes received, stored, or disposed at the site shall not contain in excess of 5 grams of Uranium 233 and Uranium 235 per cubic foot of waste.

B28. The licensee shall designate a site manager. The licensee shall advise the Department of the name and qualifications of the site manager. The site manager shall be in charge of all activities at the site within his qualifications. The licensee shall also advise the Department of the individual to be contacted on any problem not within the site manager's qualifications. The licensee shall immediately notify the Department if any change is made in these designated individuals.

B29. The licensee shall not open burn any wastes or materials at the site.

C. <u>BONDING, FEE, LEASE AND INSURANCE CONDITIONS</u>

C1. Within 30 days following the effective date of this license,

the license shall post a cash bond with the Department in the amount of $113,400. The following shall be eligible securities deemed equivalent to cash: bills, certificates, notes, bonds, or other obligations of the United States or its agencies. The cash value at the time of posting shall not be less than the required bond amount.

Interest earnings on the cash bond shall be paid annually by the Department to the licensee, except for that amount necessary to offset inflationary increases in monitoring, security, or other costs to be funded by the cash bond.

C2. The licensee shall pay a license fee to the Department in the amount of $4,890 within 30 days after the effective date of this license. Thereafter, the licensee shall pay the Department an annual license fee of $7,330 within 30 days after July 1 each year.

C3. The licensee shall pay to the Department of Environmental Quality a volumetric fee of eight cents ($0.08) per cubic foot of wastes received at the site. Such fees shall be paid by the last day of each month for wastes received at the site during the preceding month.

C4. Within 30 days after the effective date of the license, the licensee shall deed the following properties at the site to the State: radioactive waste burial area; chemical waste burial area; biodegradation basin A; chemical evaporation ponds; chemical waste process building area; and radioactive waste process area. Within 60 days after completion of on-site roads, the licensee shall deed such roads to the State.

Within 30 days after deeding of these properties to the State, a lease between the licensee and the Department for these properties shall be executed. The lease shall be maintained for the duration of this license.

C5. The licensee shall maintain liability insurance for operation of the site, with respect to all types of wastes, in the amount of not less than $1,000,000 to cover transportation of all types of wastes to the site. The licensee shall provide the Department with certified copies of such insurance policies within 30 days after the effective date of this license and of all policy changes within 30 days after each such change. All such insurance policies shall provide that such insurance shall not be cancelled or released except upon 30 days prior written notice to the Department.

C6. The licensee shall submit audited financial statements to the Department, on or before December 1 of each year, for the

annual period ending July 31 each year. Such statements shall cover both the licensee's entire operations and operation of this site. The Department shall withhold financial statements covering only this site from public disclosure.

C7. The licensee shall convey title for the entire site to the State, except for those portions previously owned by the State, in the event of any one of the following circumstances.

a. Expiration of the license due to failure of the licensee to seek renewal.

b. Termination or expiration of the license due to utilization of the site to its full capacity, as determined by the Department.

This condition shall survive the expiration or termination of the license.

D. RECORDS AND REPORTING CONDITIONS

D1. The licensee shall maintain records and submit monthly reports to the Department indicating quantities and types of wastes received, stored, and disposed at the site and fees collected therefor. Such reports shall be on forms approved by the Department.

D2. The licensee shall maintain records, on forms approved by the Department, indicating the type, quantity, and location of wastes which have been buried in burial trenches at the site. Such records shall be submitted to the Department biannually.

D3. The licensee shall maintain survey records for each burial trench, referenced to the nearest U.S.G.S. bench mark to define the exact location and boundaries of each trench. Within 60 days after completion of trenches, the licensee shall forward the required marker information and a copy of survey records to the Department.

D4. All findings and results from the licensee's environmental monitoring program shall be recorded on appropriate forms and shall be reported to the Department quarterly.

E. ENVIRONMENTAL MONITORING CONDITIONS

E1. The licensee shall conduct a chemical environmental monitoring program as follows:

a. On-site dry test wells (wells numbered B-1, B-2, B-3, B-4, B-5, and B-6) will be checked annually when the water table in the area is at its highest level. Water samples will be obtained from each well in which water is observed.

b. Monitoring wells at the end of each chemical burial trench will be checked quarterly for the presence of water. If water is observed, a water sample will be taken and the Department will be notified immediately. If no water is observed, a sample of sediment (soil) from the monitoring well will be obtained biannually. Once per year, a sample of soil from trench monitoring wells will be sent to the Department.

c. All water and soil samples required by items a and and b above will be analyzed for zinc, copper, arsenic, cadmium, chromium, lead, mercury, cyanides, chemical oxygen demand, total organic carbon, chlorides, specific conductance, chlorinated hydrocarbons, and phenols using procedures approved by the Department.

d. A sample of the resident vertebrate population and of vegetation will be obtained annually. These samples will be analyzed for zinc, copper, arsenic, cadmium, chromium, lead, mercury, cyanides, chlorinated hydrocarbons, and phenols.

E2. The licensee shall conduct a radiation environmental monitoring program as follows:

a. The on-site dry test wells will be checked annually when the water table in the area is at its highest level. If water is observed in the test well(s), samples will be obtained. Analyses for gross alpha and beta will be conducted.

b. The on-site water supply well will be sampled quarterly. Analyses for gross alpha, gross beta, and for tritium will be conducted quarterly. Samples will be analyzed for radium and strontium annually.

c. The monitoring wells at the end of each radioactive waste burial trench will be checked monthly for the presence of water. If water is observed, the Department will be notified immediately, a sample will be obtained, and an analysis for gross beta and gross alpha will be conducted. If no water is observed, samples of the sediment (soil) will be obtained from the trench monitoring wells on a quarterly basis. Analyses on these samples will include gross beta, gross alpha, and a gamma scan. Once per year, a sample of soil from trench monitoring wells will be sent to the Department.

d. Two off-site water samples will be obtained biannually at Alkali Flat W-1 and the Hillside Water Seep. Analyses for gross alpha, gross beta, and for tritium will be conducted.

e. Six on-site and two off-site samples of soil will be obtained quarterly. These samples will be taken at the same general location each quarter and will be analyzed for gross beta and a gamma scan annually.

f. Three on-site and one off-site samples of vegetation will be obtained biannually. These samples will be analyzed for gross beta and a gamma scan.

g. A sample of a resident steer from adjoining property will be obtained every 18 to 24 months at the time of slaughter. A gamma scan of the groin muscle and thyroid will be made. A sample of resident field mice will be obtained on an annual basis. A gamma scan of the groin muscle and thyroid will be made.

h. An air sampler will be operated on-site for at least two hours each day. The filter will be changed every two weeks and analyzed for gross beta activity.

i. The perimeter fence line of the licensee's property will be surveyed quarterly using a portable end window Geiger counter. In addition, two TLD's or film badges will be placed at two points on the perimeter fence. These devices will be changed and analyzed quarterly.

j. The level in liquid or slurry radioactive waste tanks will be checked weekly. Each such tank will be pressure tested no less frequently than once every six months using procedures approved by the Department.

F. APPROVED PLANS AND PROCEDURES

As referred to in conditions F1, F2, and F3, the licensee's management plans shall mean the licensee's June 14, 1974 Program for Management of Hazardous Materials and revisions and additions thereto submitted to the Department by letter of September 24, 1974.

F1. The following general plans and procedures are approved:

a. Location of facilities at the site as described on Licensee's Plot Plan (Drawing No. 1), dated June 25, 1974.

b. Security plans as described on pages 4 and 5 of the licensee's management plans, except that a three strand barb wire fence shall be maintained around the perimeter of the site.

c. Firefighting procedures as described on pages 2, 6, and 7 of the licensee's management plans, except that the requirements of condition B7 shall also apply.

d. Fire and water systems as described on page 2 and Figure G-5 of the licensee's management plans, except that 200 feet of fire hose and a nozzle be provided at each fire hydrant.

e. Roads as described on the Licensee's Plot Plan (Drawing No. 1), dated June 25, 1974 and on page 2 and Figure G-1 of the licensee's management plans.

f. Operations center as described on page 2 and Figure G-4 of the licensee's management plans.

g. Machine and storage building as described on page 1 and Figure G-2 of the licensee's management plans.

F2. The following plans and procedures for transportation, handling, disposal, and treatment of chemical wastes are approved:

a. Chemical staging area (drum storage pad) and tank farm as described on pages 2 and 3 and Figure C-1 of the licensee's management plans.

b. Chemical process building as described on page 1 and Figures G-3 and C-4 of the licensee's management plans, except that only facilities for office, laboratory, sanitary facilities, and emergency shower are approved.

c. Evaporation ponds, three only, as described on page 17, item 1, and Figure C-5 of the licensee's management plans.

d. Chemical burial trench, three only, as described on page 14, item 1, and Figure C-2 of the licensee's management plans, with the following additions and exceptions:

(1) Trench floor and gravel ditch to be sloped at 1 foot per 100 feet toward sample pipe (monitoring well).

(2) Sample pipe to be installed at trench edge rather than at trench center. Sample pipe shall be in place before disposal of wastes in trench is begun. Adequate provision shall be made to allow sampling of soil and water below sample pipe.

(3) An earthen berm of two feet minimum height shall be maintained along the uphill edge of an active trench (stockpiling of excavated soil along the uphill edge will satisfy this requirement). A drainage ditch of two feet minimum depth shall be maintained adjacent to each end of the trench.

(4) Burial of wastes shall commence in the end of the trench opposite the monitoring well. Equipment operating in the trench shall not travel on or across the gravel ditch.

(5) Final mounding of completed trenches is to extend two feet beyond the trench edge. Suitable vegetation is to be established and maintained on completed and mounded trenches.

e. Biodegradation bed, Basin A, Phase 1 only, as described on page 15 and Figures B-1 and B-2 of the licensee's management plans.

f. Procedures for the pickup and transportation of chemical wastes as described on pages 55 and 56 of the licensee's management plans.

F3. The following plans and procedures for transportation, handling,

disposal, and treatment of radioactive wastes are approved:

a. Radioactive waste burial trenches, three only, as described on Figure R-3 of the licensee's management plans, with the following additions and exceptions:

(1) Trench floor and gravel ditch to be sloped at 1 foot per 100 feet toward sample pipe (monitoring well).

(2) Sample pipe to be installed at trench edge rather than at trench center. Sample pipe shall be in place before disposal of wastes in trench is begun. Adequate provision shall be made to allow sampling of soil and water below sample pipe.

(3) An earthen berm of two feet minimum height shall be maintained along the uphill edge of an active trench (stockpiling of excavated soil along the uphill edge will satisfy this requirement). A drainage ditch of two feet minimum depth shall be maintained adjacent to each end of the trench.

(4) Burial of wastes shall commence in the end of the trench opposite the monitoring well. Equipment operating in the trench shall not travel on or across the gravel ditch.

(5) Final mounding of completed trenches is to extend two feet beyond the trench edge. Suitable vegetation is to be established and maintained on completed and mounded trenches.

b. Radioactive slit trench, one only, as described on Figure R-4 of the licensee's engineering plans, except that final mounding shall extend a minimum of two feet beyond and two feet above the trench edge.

c. Radioactive liquid and resin transfer and solidification facilities as described on page 3 and Figures R-1 and R-2 of the licensee's management plans, subject to the additional requirements of condition B25.

d. Procedures for the Pickup and Transportation of Packaged Radioactive Wastes as described on pages 64-66 of the licensee's management plans.

e. Procedures for the transfer of Radioactive Spent Resins from Transport Cask to Storage Tank or Disposal Container as described on pages 69-71 of the licensee's management plans.

f. Procedures for the Removal of Irradiated Material from Shield Cask and Burial as described on pages 72-74 of the licensee's management plans.

g. General Procedures for Trench Burial of Radioactive Waste as described on page 75 of the licensee's management plans, except that item 6, page 75, is not approved.

h. Procedures for the Solidification of Liquid Radioactive Wastes as described on pages 76 and 77 of the licensee's management plans.

i. Radiation Protection Program as described on pages 78-79 of the licensee's management plans.

j. Radiation Training Program as described on pages 80-82 of the licensee's management plans.

k. Radiation Detection and Measurement Instruments as described on page 83 of the licensee's management plans.

l. Emergencies procedures as described on pages 84 and 85 of the licensee's management plans.

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